

CLAIMS

What is claimed is:

1. A system for finding a longest prefix match for a key in a computer network,
the system comprising:

a main engine for storing a first plurality of addresses and for searching the first
plurality of addresses for the longest prefix match for the key, none of the first plurality of
addresses being a prefix for another address of the first plurality of addresses; and

an auxiliary engine for storing and searching a second plurality of addresses, a first
address of the second plurality of addresses capable of including the prefix for a second
address of the first plurality of addresses or for a third address for the second plurality of
addresses, none of the first plurality of addresses being the prefix for any of the second
plurality of addresses, each of the second plurality of addresses being distinct from each of
the first plurality of addresses.

2. The system of claim 1 wherein each of the first plurality of addresses has a
first length, each of the second plurality of addresses has a second length and wherein the
key is capable of having a maximum length, the first length being at least a particular portion
of the maximum length.

3. The system of claim 2 wherein the main engine does not search the first
plurality of addresses if an actual length of the key is less than the particular portion of the
maximum length.

4 4. The system of claim 2 wherein the maximum length is thirty-two bits and
5 wherein the first length is sixteen bits.

1 5. The system of claim 1 wherein the auxiliary engine searches the second
2 plurality of addresses only if the longest prefix match is not found in the main engine.

1 6. The system of claim 1 wherein a new address is added to the first plurality of
2 addresses if the new address is not the prefix of any of the first plurality of addresses and the
3 new address has a length that is greater than a particular length or if the new address has a
length that is greater than a particular length, a particular address of the first plurality of
addresses is a prefix of the new address and the length of the new address is greater than an
address length of the particular entry.

1 7. The system of claim 1 wherein if a particular address of the first plurality of
2 addresses is deleted, then a replacement address from the second plurality of addresses in the
auxiliary engine is moved to the main engine if the replacement address is a prefix of the
4 particular address, the replacement address has a length greater than a particular length and
5 the length of the address is not shorter than an index for a next bit to test corresponding to an
6 adjacent address next to the particular addresses in the main engine.

1 8. The system of claim 1 wherein the main engine is a direct table having a
2 plurality of table addresses and wherein each of the plurality of table addresses includes a
3 tree.

1 9. The system of claim 8 wherein the tree is a Patricia tree.

1 10. A method for providing a mechanism for finding a longest prefix match for a
2 key in a computer network, the method comprising the steps of:

3 (a) providing a main engine for storing a first plurality of addresses and for
4 searching the first plurality of addresses for the longest prefix match for the key, none of the
5 first plurality of addresses being a prefix for another address of the first plurality of
6 addresses; and

7 (b) providing an auxiliary engine for storing and searching a second plurality of
addresses, a first address of the second plurality of addresses capable of including the prefix
for a second address of the first plurality of addresses or for a third address for the second
plurality of addresses, none of the first plurality of addresses being the prefix for any of the
second plurality of addresses, each of the second plurality of addresses being distinct from
each of the first plurality of addresses.

1 11. The method of claim 10 wherein each of the first plurality of addresses has a
2 first length, each of the second plurality of addresses has a second length and wherein the
3 key is capable of having a maximum length, the first length being at least a particular portion
4 of the maximum length.

1 12. The method of claim 11 wherein the main engine does not search the first
2 plurality of addresses if an actual length of the key is less than the particular portion of the
3 maximum length.

1 13. The method of claim 11 wherein the maximum length is thirty-two bits and
2 wherein the first length is sixteen bits.

1 14. The method of claim 10 wherein the auxiliary engine searches the second
2 plurality of addresses only if the longest prefix match is not found in the main engine.

1 15. The method of claim 10 wherein a new address is added to the first plurality
2 of addresses if the new address is not the prefix of any of the first plurality of addresses and
3 the new address has a length that is greater than a particular length or if the new address has
4 a length that is greater than a particular length, a particular address of the first plurality of
5 addresses is a prefix of the new address and the length of the new address is greater than an
6 address length of the particular entry.

1 16. The method of claim 10 wherein if a particular address of the first plurality of
2 addresses is deleted, then a replacement address from the second plurality of addresses in the
3 auxiliary engine is moved to the main engine if the replacement address is a prefix of the
4 particular address, the replacement address has a length greater than a particular length and
5 the length of the address is not shorter than an index for a next bit to test corresponding to an
6 adjacent address next to the particular addresses in the main engine.

1 17. The method of claim 11 wherein the step of providing the main engine (a)
2 further includes the step of:

3 (a1) providing a direct table having a plurality of table addresses and wherein each

4 of the plurality of table addresses includes a tree.

1 18. The method of claim 17 wherein the tree is a Patricia tree.

1 19. A method for determining a longest prefix match for a key in a computer
2 network, the method comprising the steps of:

3 (a) searching a main engine for the longest prefix match, the main engine storing
4 a first plurality of addresses and for searching the first plurality of addresses for the longest
5 prefix match for the key, none of the first plurality of addresses being a prefix for another
address of the first plurality of addresses; and

(b) searching an auxiliary engine for the longest prefix match only if the longest
prefix match is not found in the main engine, the auxiliary engine for storing and searching a
second plurality of addresses, an entry of the second plurality of addresses capable of
including the prefix for an address of the first plurality of addresses or for a second address
for the second plurality of addresses, none of the first plurality of addresses being the prefix
for any of the second plurality of addresses, each of the second plurality of addresses being
distinct from each of the first plurality of addresses.

1 20. A computer-readable medium containing a program for providing a
2 mechanism for finding a longest prefix match for a key in a computer network, the program
3 including instructions for:

4 (a) providing a main engine for storing a first plurality of addresses and for
5 searching the first plurality of addresses for the longest prefix match for the key, none of the

6 first plurality of addresses being a prefix for another address of the first plurality of
7 addresses; and

8 (b) providing an auxiliary engine for storing and searching a second plurality of
9 addresses, a first address of the second plurality of addresses capable of including the prefix
10 for a second address of the first plurality of addresses or for a third address for the second
11 plurality of addresses, none of the first plurality of addresses being the prefix for any of the
12 second plurality of addresses, each of the second plurality of addresses being distinct from
13 each of the first plurality of addresses.

21. A computer-readable medium containing a program for determining a longest
prefix match for a key in a computer network, the program including instructions for:

(a) searching a main engine for the longest prefix match, the main engine storing
a first plurality of addresses and for searching the first plurality of addresses for the longest
prefix match for the key, none of the first plurality of addresses being a prefix for another
address of the first plurality of addresses; and

(b) searching an auxiliary engine for the longest prefix match only if the longest
8 prefix match is not found in the main engine, the auxiliary engine for storing and searching a
9 second plurality of addresses, an entry of the second plurality of addresses capable of
10 including the prefix for an address of the first plurality of addresses or for a second address
11 for the second plurality of addresses, none of the first plurality of addresses being the prefix
12 for any of the second plurality of addresses, each of the second plurality of addresses being
13 distinct from each of the first plurality of addresses.